

CLAIMS:

1. A method for feeding electrical energy into an alternating current electrical mains, the method comprising the steps of:
 - a) recording a mains signal for obtaining a measured mains signal;
 - b) generating a reference signal having a fundamental harmonic frequency which is within a tolerance band around a fundamental harmonic frequency of the mains signal;
 - 5 c) deriving a delayed mains signal from the measured mains signal;
 - d) deriving a delayed reference signal from the reference signal;
 - e) multiplying the delayed mains signal with the reference signal for obtaining a first multiplied signal;
 - 10 f) multiplying the mains signal with the delayed reference signal for obtaining a second multiplied signal;
 - g) determining a phase difference between a fundamental harmonic frequency of the mains signal and the fundamental harmonic frequency of the reference signal by determining a difference between the first and the second multiplied signals;
 - 15 h) adjusting the fundamental harmonic frequency of the reference signal based on the phase difference;
 - i) synchronizing a converter for converting the energy into an alternating current electrical energy, to the adjusted fundamental harmonic frequency of the reference signal; and
 - j) feeding the alternating current electrical energy into the mains, in phase with the reference signal.
2. The method according to claim 1, further comprising the steps of:
 - k) multiplying the mains signal with the reference signal for obtaining a third multiplied signal;
 - 25 l) multiplying the delayed mains signal with the delayed reference signal for obtaining a fourth multiplied signal;
 - m) determining an amplitude of the fundamental harmonic frequency component of the mains signal by determining a sum of the third and the fourth multiplied signals;and wherein step j) comprises the further step of:

j1) determining a magnitude of the electrical energy to be fed into the mains, based on the amplitude of the fundamental harmonic frequency component of the mains signal.

3. The method according to any of the preceding claims, characterized in that the
5 delayed mains signal and the delayed reference signal are each delayed by a time period of substantially one quarter of a repetition time of the reference signal.

4. The method according to any of the preceding claims, characterized in that the
10 method comprises the further step of, prior to step h): averaging the phase difference over a repetition time of the reference signal.

5. The method according to any of claims 2 -4, characterized in that the method
comprises the further step of, prior to step j1):
averaging the amplitude over the repetition time of the reference signal.

15 6. The method according to any of the preceding claims, characterized in that the reference signal is a substantially sinusoidal signal.

7. The method according to any of the preceding claims, characterized by
20 repeating at least steps a) to j)).

8. A system for feeding electrical energy into an alternating current electrical
mains, the system comprising:

- an energy source for supplying the electrical energy to the system,

25 - a converter for converting the electrical energy into an alternating current energy, and

- a synchronization circuit for synchronizing the converter to a repetition frequency of the
alternating current mains, characterized in that
the synchronization circuit comprises means for

a) recording a mains signal for obtaining a measured mains signal;

30 b) generating a reference signal having a fundamental harmonic frequency which is within a
tolerance band around a fundamental harmonic frequency of the mains signal;

c) deriving a delayed mains signal from the measured mains signal;

d) deriving a delayed reference signal from the reference signal;

- e) multiplying the delayed mains signal with the reference signal for obtaining a first multiplied signal;
- f) multiplying the mains signal with the delayed reference signal for obtaining a second multiplied signal;
- 5 g) determining a phase difference between a fundamental harmonic frequency of the mains signal and the fundamental harmonic frequency the reference signal by determining a difference between the first and the second multiplied signals;
- h) adjusting the fundamental harmonic frequency of the reference signal based on the phase difference;
- 10 i) synchronizing the converter to the adjusted fundamental harmonic frequency of the reference signal;
and in that the converter comprises means for feeding the electrical energy into the mains, in phase with the reference signal.
- 15 9. The system according to claim 8, characterized in that the synchronization circuit comprises a digital signal processor.
- 10. The system according to claim 8 or 9, characterized in that the energy source comprises at least one solar cell and in that the converter comprises an inverter.